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THE USE OF SODIUM TAUROCHOLATE MEDIUM FOR IDENTIFYING *CANDIDA ALBICANS**

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The ability to form chlamydospores is a well known characteristic of *Candida albicans,* and provides a valuable means of identifying this organism. Numerous culture media induce chlamydospore formation and most of them have been used for subculturing suspected *Candida albicans* strains after their primary isolation on Sabouraud dextrose agar (1, 2). One such medium is sodium taurocholate agar (3) introduced by F. Raubitschek (4). For over ten years this medium has been used in our laboratory for the induction of chlamydospore formation and subcultures from several thousand patients have been examined.

In the present investigation the value of sodium taurocholate agar for the rapid diagnosis of *Candida albicans* and the selective discouragement of bacterial growth in primary culture were assessed. In a small number of cases this medium was compared both in primary culture and on subculture with a) cream of rice medium (5, 6) which, according to Duncan & Floeder (7), is the most suitable medium for inducing the formation of chlamydospores of *C. albicans* on subculture, and b) Czapek-Dox medium, which according to Dawson (8) is suitable for the same purposes in primary isolates.

Tween 80 was often incorporated in the media (9). Like sodium taurocholate it serves to reduce surface tension. Because of this similarity in function, the ability of Tween 80 to induce chlamydospores was investigated.

MATERIAL AND METHODS

Media

1) Glucose 2%, bactopeptone 1%, yeast extract 0.25%.
2) Sodium taurocholate (3).
3) Cream of rice medium (5, 6).
4) Czapek-Dox medium.
5) Tween 80 (1%).

All media were prepared with 1.8% agar. Tween 80 was sometimes added to media 2, 3 and 4, and penicillin 50 units/ml and streptomycin 50 γ/ml to media 2 and 4.

Primary cultures of strains of *Candida albicans* were obtained directly from patients attending the dermatology and gynecology departments. *Candida albicans* was identified by colonial and microscopic morphology, fermentation tests, and its ability to form chlamydospores on sodium taurocholate medium (4).

Specimens were collected on cotton-wool swabs which were immediately smeared on 5 ml slopes of the chlamydospore inducing media under investigation, and on glucose peptone slopes. These were all incubated at 28°C., the cultures were examined after 24, 48 and 72 hours, and the type of growth was observed. Presence or absence of chlamydospores was determined by microscopic examination directly through the test tubes at 50 × magnification.

Subcultures were made on petri dishes containing 15 ml. of medium. A loopful of the strain growing on glucose peptone was diluted in 1 ml saline and then spread on the surface of the medium under investigation. The plates were inverted and incubated at 28°C. Examination for chlamydospores was carried out after 24, 48 and 72 hours at 50 × magnification.

RESULTS

Primary Cultures

Of 225 strains of *C. albicans* identified, 148 (66%) produced chlamydospores in primary culture on the sodium taurocholate medium. Sodium taurocholate, sodium taurocholate + Tween 80, and cream of Rice + Tween 80 media were compared for their ability to induce chlamydospore formation in 40 primary isolations of *C. albicans.* No significant differences were found.

Sodium taurocholate + Tween 80 and Czapek-Dox + Tween 80 media, containing penicillin and streptomycin were compared for their ability to induce chlamydospore formation in 25 primary isolations of *C. albicans,* chosen at random. The ability of these strains to produce chlamydospores on any medium was unknown. All of these 25 strains formed chlamydospores on sodium taurocholate + Tween 80, but only 15 did so on Czapek-Dox + Tween 80.

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Subcultures

A total of 100 strains of *C. albicans* identified on the basis of morphology and fermentation reactions were subcultured on sodium taurocholate and on Cream of Rice media with or without Tween 80. The strains were chosen at random and the ability of these strains to produce chlamydospores on any medium was unknown. Table 1 shows the number of strains that formed chlamydospores. Sodium taurocholate + Tween 80 encouraged chlamydospore formation in the largest number of strains. Moreover, all the strains which produced chlamydospores on any of the other media did so on sodium taurocholate + Tween 80 as well.

The possibility that Tween 80 alone might induce chlamydospore formation was investigated using 25 strains which had produced chlamydospores previously on sodium taurocholate + Tween 80. Twenty two of these strains formed chlamydospores on Tween 80.

Bacterial Growth in Primary Cultures

Of 353 swabs cultured from clinical material on both glucose-peptone and sodium taurocholate slopes without antibiotics and which yielded no growth of *Candida* species, 280 (79%) showed bacterial growth on glucose peptone, and 79 (22%) on sodium taurocholate. Primary culture of clinical material on media containing no antibiotics showed a low incidence of bacterial growth on the two sodium taurocholate media (Table 2).

TABLE 1

Number of C. albicans *strains which formed chlamydospores on different media.*
(Total number tested: 100)

Sodium taurocholate	Cream of Rice	Sodium taurocholate + Tween 80	Cream of Rice + Tween 80
90	79	95	88

TABLE 2

No. of cases showing bacterial growth on 4 media in use for the detection of Candida species inoculated simultaneously with clinical material (60 cases)

Glucose peptone	Sodium taurocholate	Sodium taurocholate + Tween 80	Cream of Rice + Tween 80
45	17	14	47

CONCLUSIONS AND SUMMARY

The present study was designed to test sodium taurocholate medium from induction of chlamydospore formation of *C. albicans* in primary cultures, and to compare it with other media, without subculturing. Czapek-Dox medium + Tween 80 (8) seemed to give less satisfactory results in our hands than sodium taurocholate + Tween 80.

Numerous culture media are in current use for the induction of chlamydospores in subcultures of *C. albicans* but none of them invariably produces chlamydospores. Cream of Rice + Tween 80 was found by Taschdjian and by Duncan & Floeder to be the most satisfactory in subcultures. Although the number of cases in the present study is small, it would seem that sodium taurocholate + Tween 80 is preferable to cream of Rice + Tween 80 because:

1) it more frequently induces chlamydospores; dospores;
2) it is transparent, and therefore the tubed culture can readily be examined for chlamydospores;
3) it is chemically defined;
4) it reduces the growth of bacteria and acts as a simple selective medium.

Tween 80, which to date has only been used to improve standard media, can induce chlamydospore formation when used alone in agar, but whether it compares favorably with other media has not been established in this study.

REFERENCES

1. Kelly, J. P. and Funigiello, F.: *Candida albicans:* A study of media designed to promote chlamydospore production. J. Lab. & Clin. Med., *53:* 807, 1959.
2. Ridley, M. F. A comparison of methods for the identification of *Candida albicans*. Aust. J. Derm., *5:* 209, 1960.
3. Aschner, M.: A simple medium for chlamydospore formation of *Candida albicans*. Proc. Coment. Scient. Soc. Bull. Res. Council, Israel, 1956.
4. Raubitschek, F.: Taurocholate agar for chlamydospore production by *Candida albicans*. Mycopathologia, *9:* 285, 1958.
5. Taschdjian, C. L.: A simply prepared identification medium for *Candida albicans*. Mycologia, *45:* 474, 1953.

6. Taschdjian, C. L.: Routine identification of *Candida albicans:* Current methods and a new medium. Mycologia, *49:* 332, 1957.
7. Duncan, J. and Floeder, J.: A comparison of media for the production of chlamydospores by *Candida albicans*. Am. J. Med. Techn. *29:* 199, 1963.
8. Dawson, Ch.O.: Identification of *Candida albicans* in primary culture. Sabouraudia, *1:* 214, 1962.
9. Walker, L. and Huppert, M.: Cornmeal-Tween agar: An improved medium for the identification of *Candida albicans*. Am. J. Clin. Path., *33:* 190, 1960.